United States Patent [19]

Lowe

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[54] **CONTAINER FILLING APPARATUS**

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[51] **Int. Cl.**[5] **B65B 3/28**

[52] **U.S. Cl.** **141/83;** 141/95; 141/198; 141/88; 141/250; 141/263; 141/47; 222/494; 137/393

[58] **Field of Search** ..... 141/94, 95, 96, 83, 141/192, 198, 86, 87, 88, 250, 255, 263, 279, 284, 47, 311 A, 374; 137/393, 312, 313; 222/108, 494, 491, 510, 519, 515, 556

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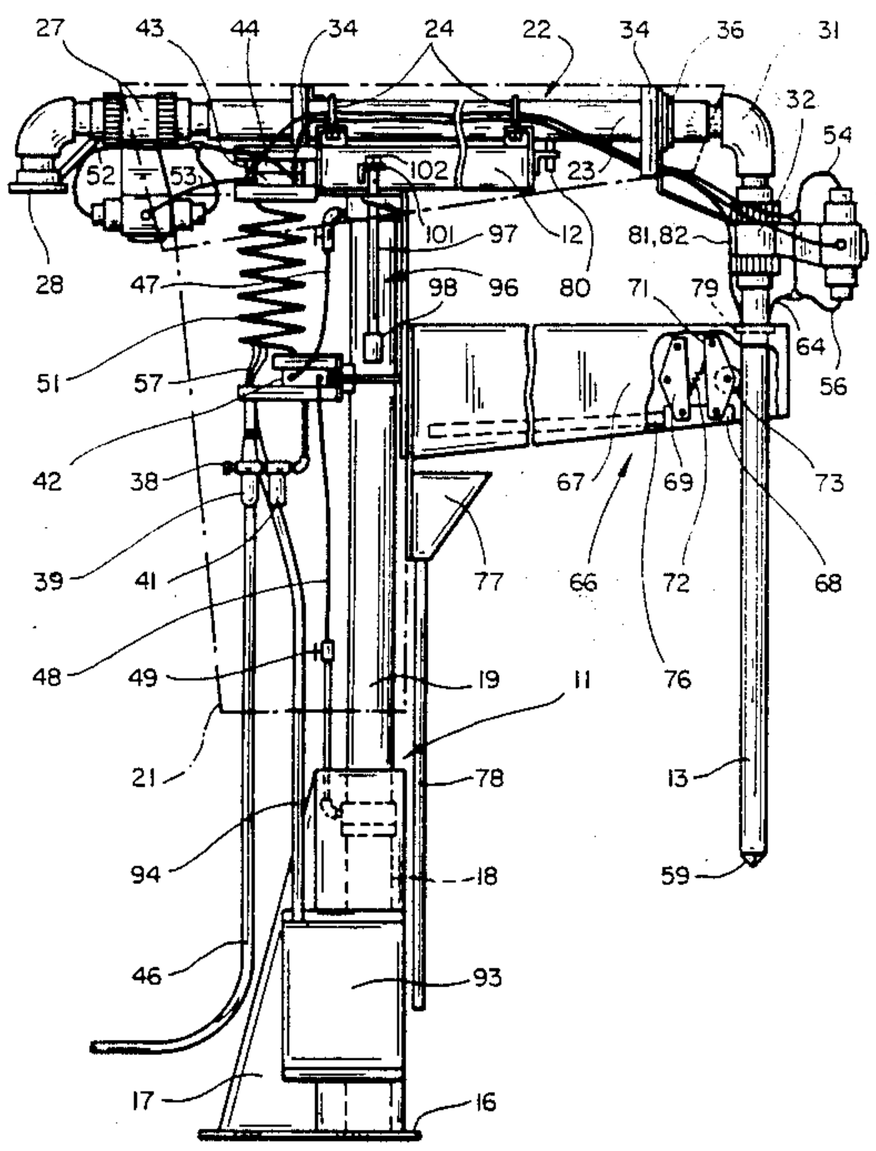
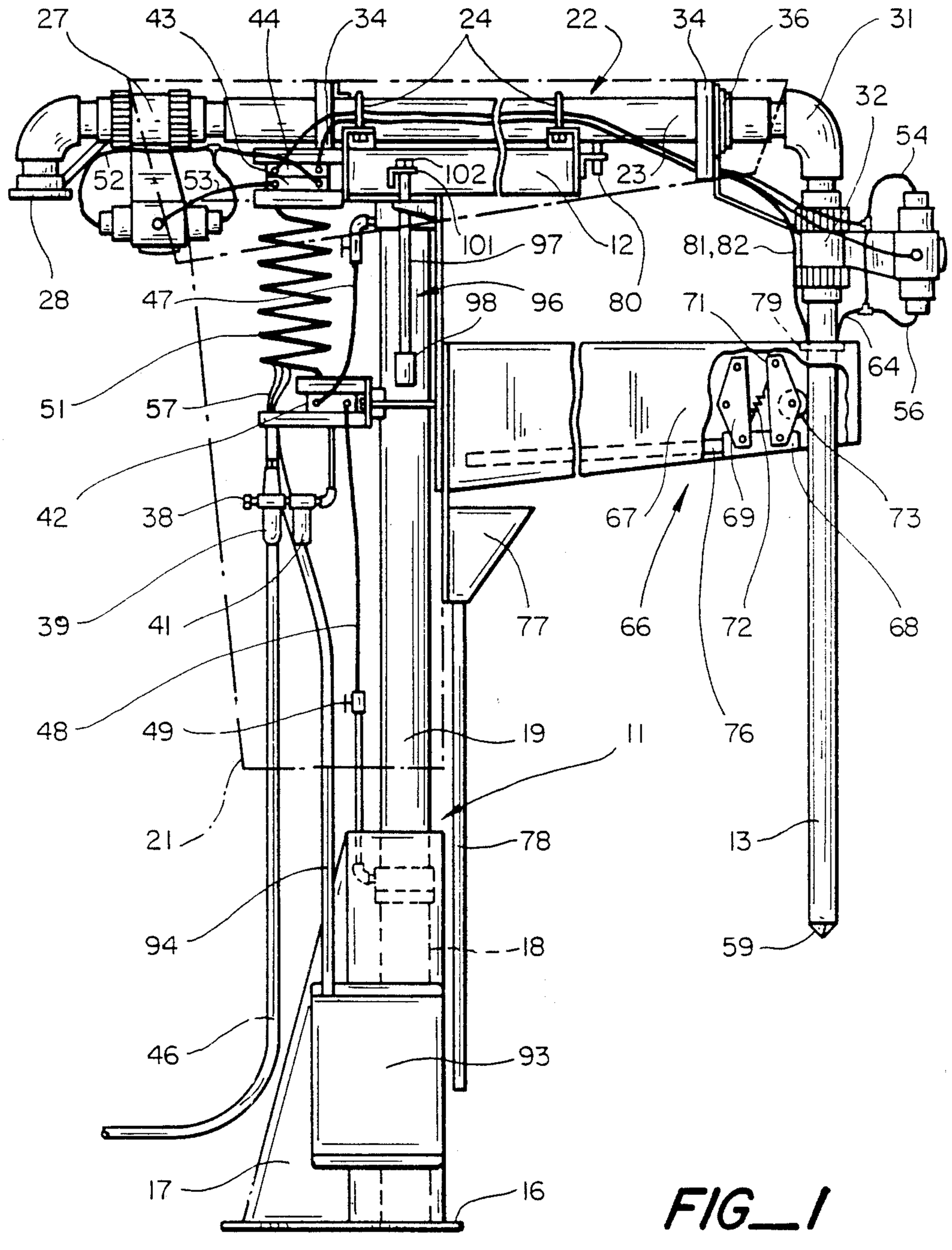
Primary Examiner—Ernest G. Cusick
Attorney, Agent, or Firm—Flehr, Hohbach, Test, Albritton & Herbert

[57] **ABSTRACT**

Apparatus for filling drums and other containers with a lilquid product. The apparatus can be used for both subsurface and top filling operations. The level of the liquid in the container is monitored to prevent overfilling and withdrawal of the lance at an incorrect speed during a subsurface filling operation. A self closing cap is provided at the lower end of the lance, and a drip catcher is automatically moved into position beneath the lance when it is withdrawn from the container.

11 Claims, 8 Drawing Sheets

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41
77
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94
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93
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16

FIG_1

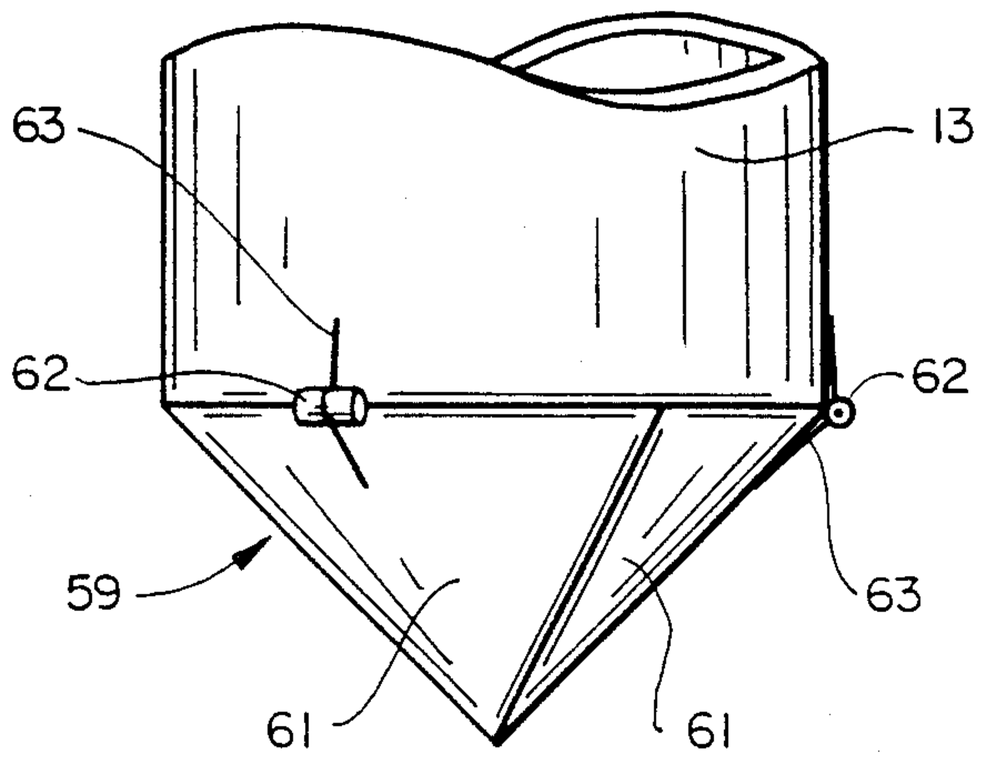


FIG_2

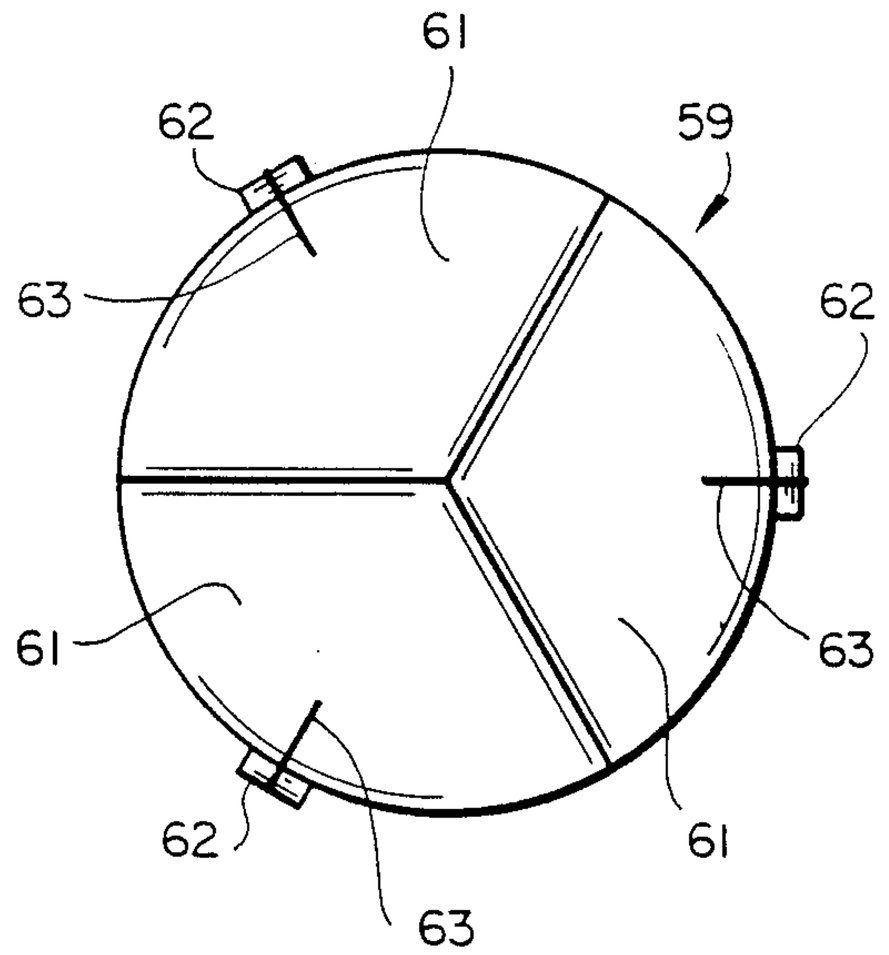


FIG_3

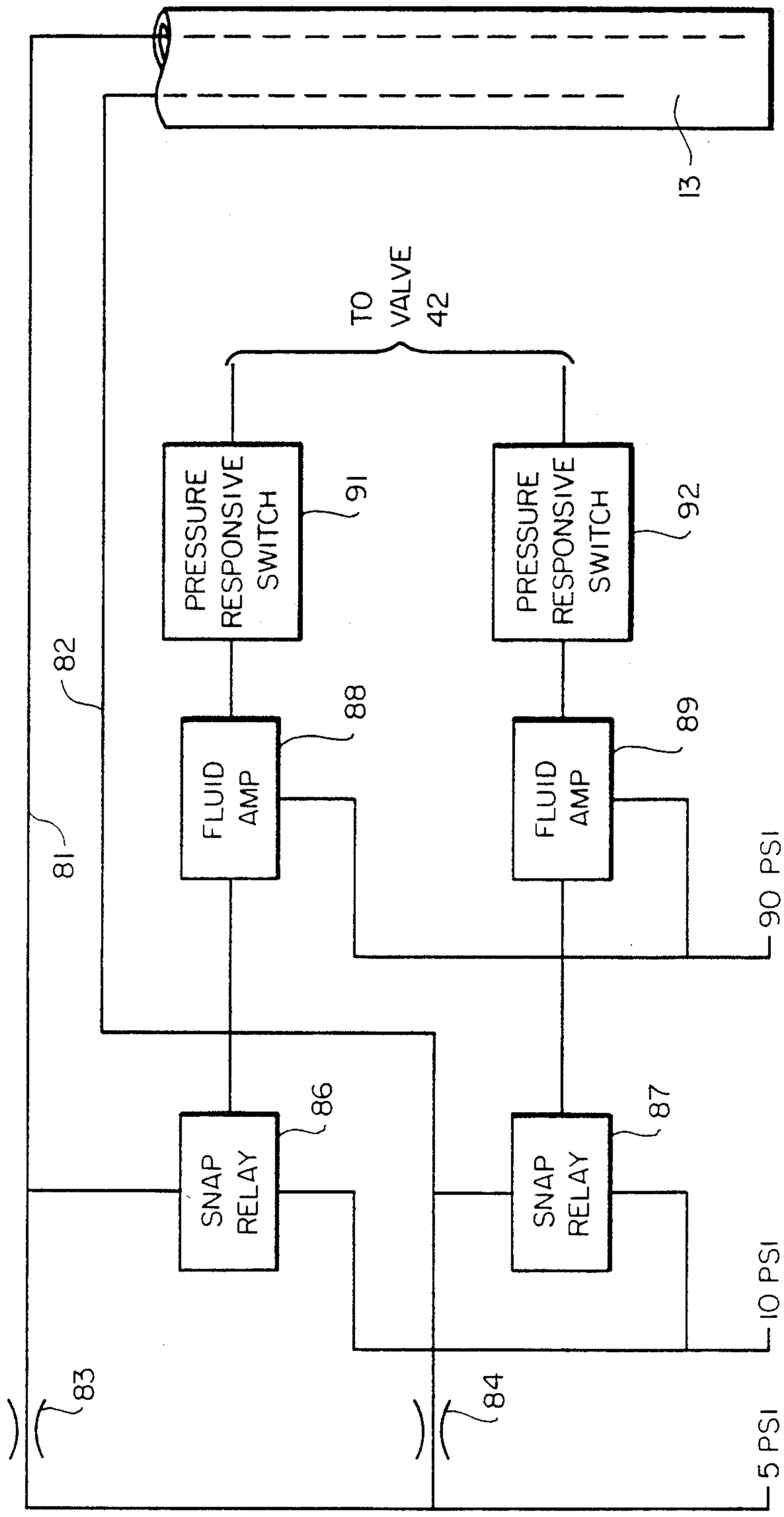
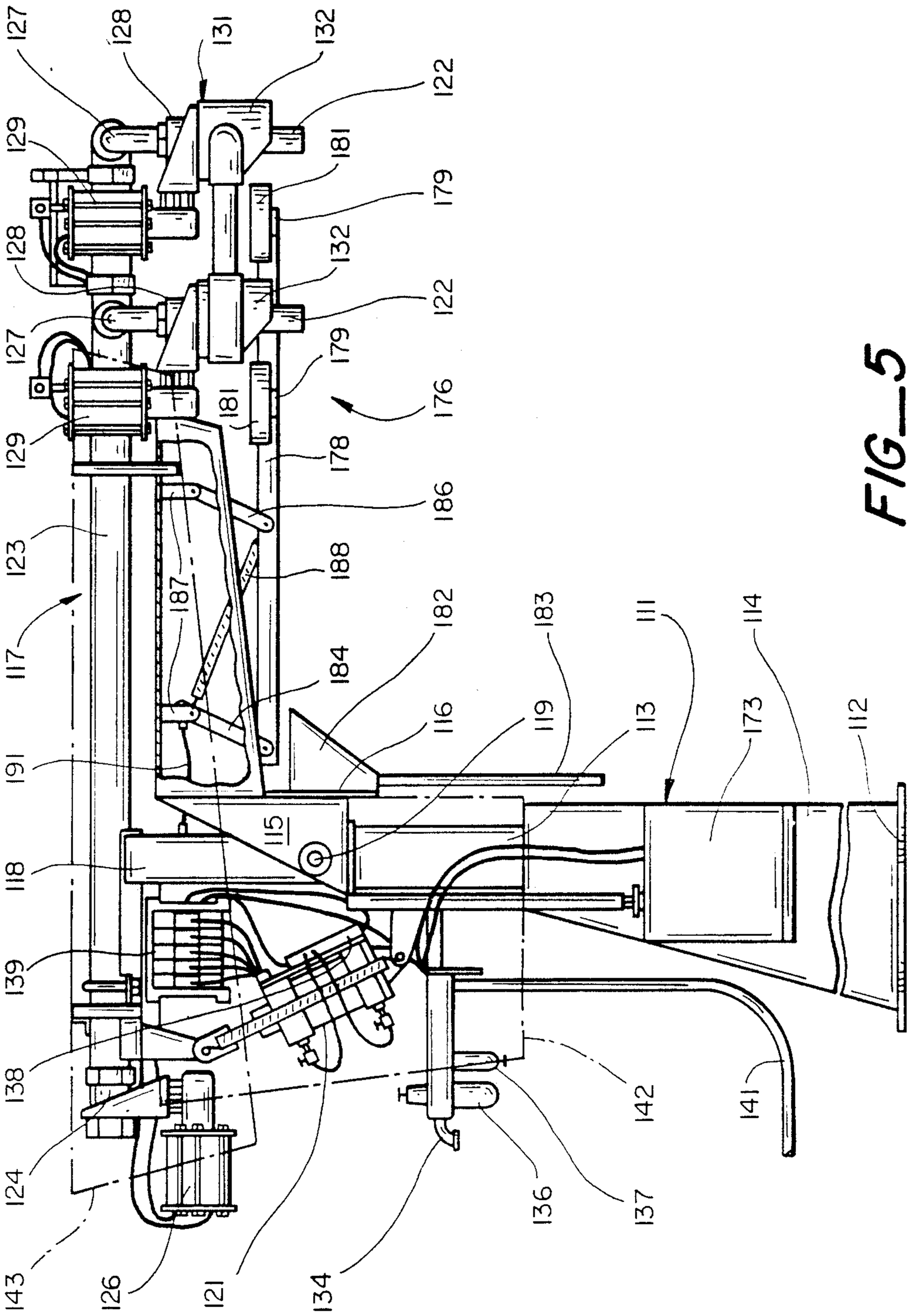

13
TO VALVE 42
PRESSURE RESPONSIVE SWITCH
91
PRESSURE RESPONSIVE SWITCH
92
FLUID AMP
88
FLUID AMP
89
90 PSI
82
81
SNAP RELAY
86
SNAP RELAY
87
10 PSI
83
84
5 PSI

FIG_4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128
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132
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178
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123
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187
182
183
111
114
184
117
116
119
113
173
112
191
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118
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124
142
141
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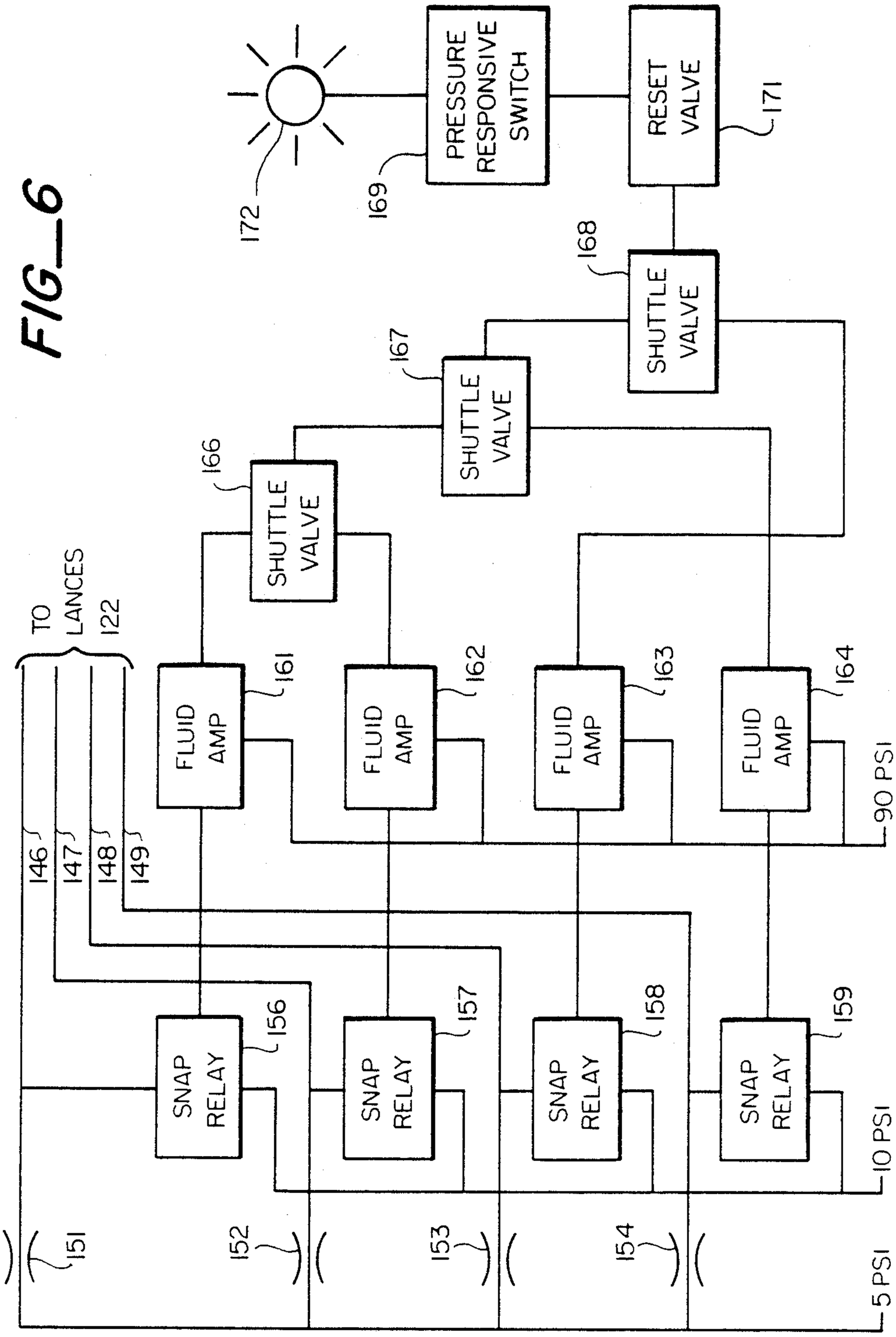
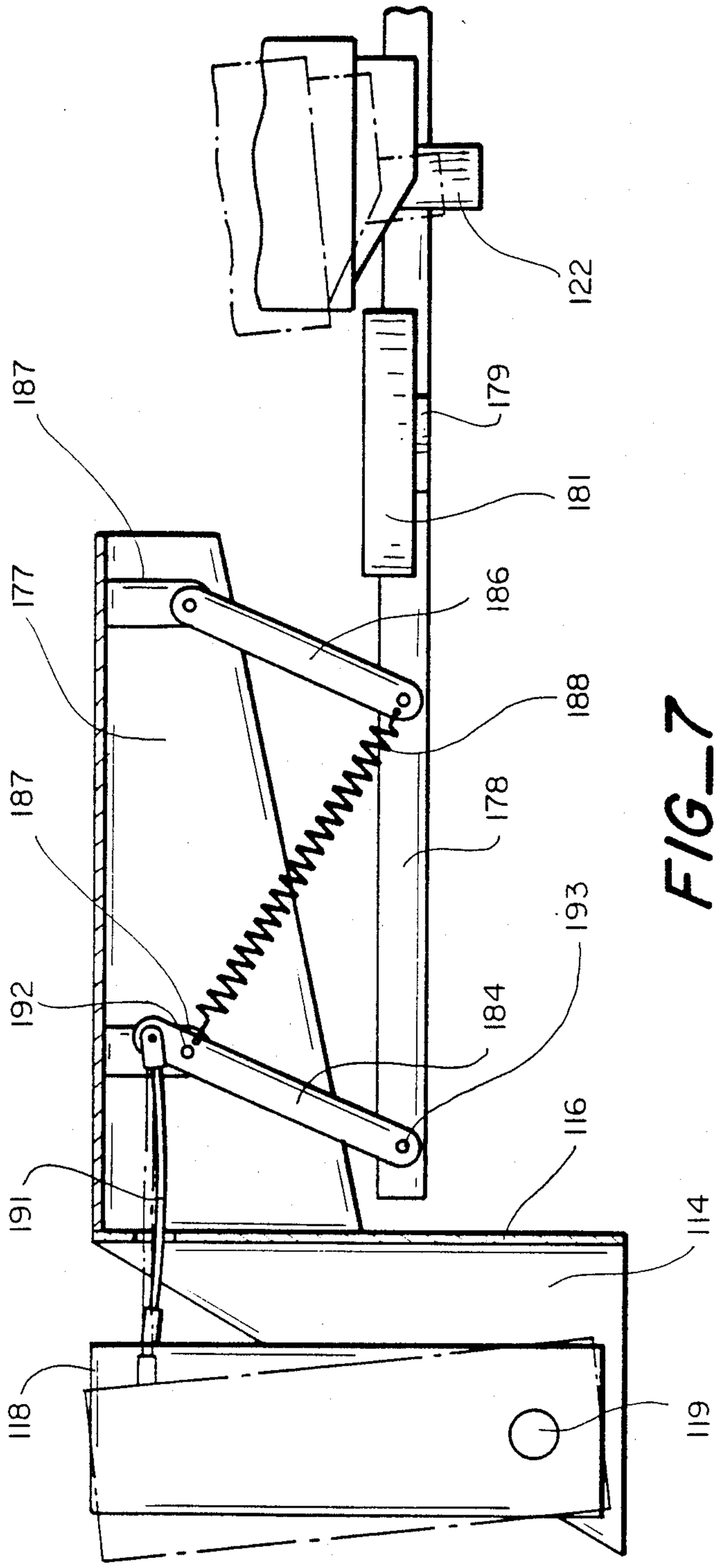
143
126
121
134

FIG_5

FIG_6


PRESSURE RESPONSIVE SWITCH
RESET VALVE
171
172
169
168
SHUTTLE VALVE
167
SHUTTLE VALVE
166
SHUTTLE VALVE
TO LANCES 122
FLUID AMP
161
FLUID AMP
162
FLUID AMP
163
FLUID AMP
164
90 PSI
146
147
148
149
SNAP RELAY
156
SNAP RELAY
157
SNAP RELAY
158
SNAP RELAY
159
10 PSI
151
152
153
154
5 PSI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187
179
181
177
186
188
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178
193
192
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116
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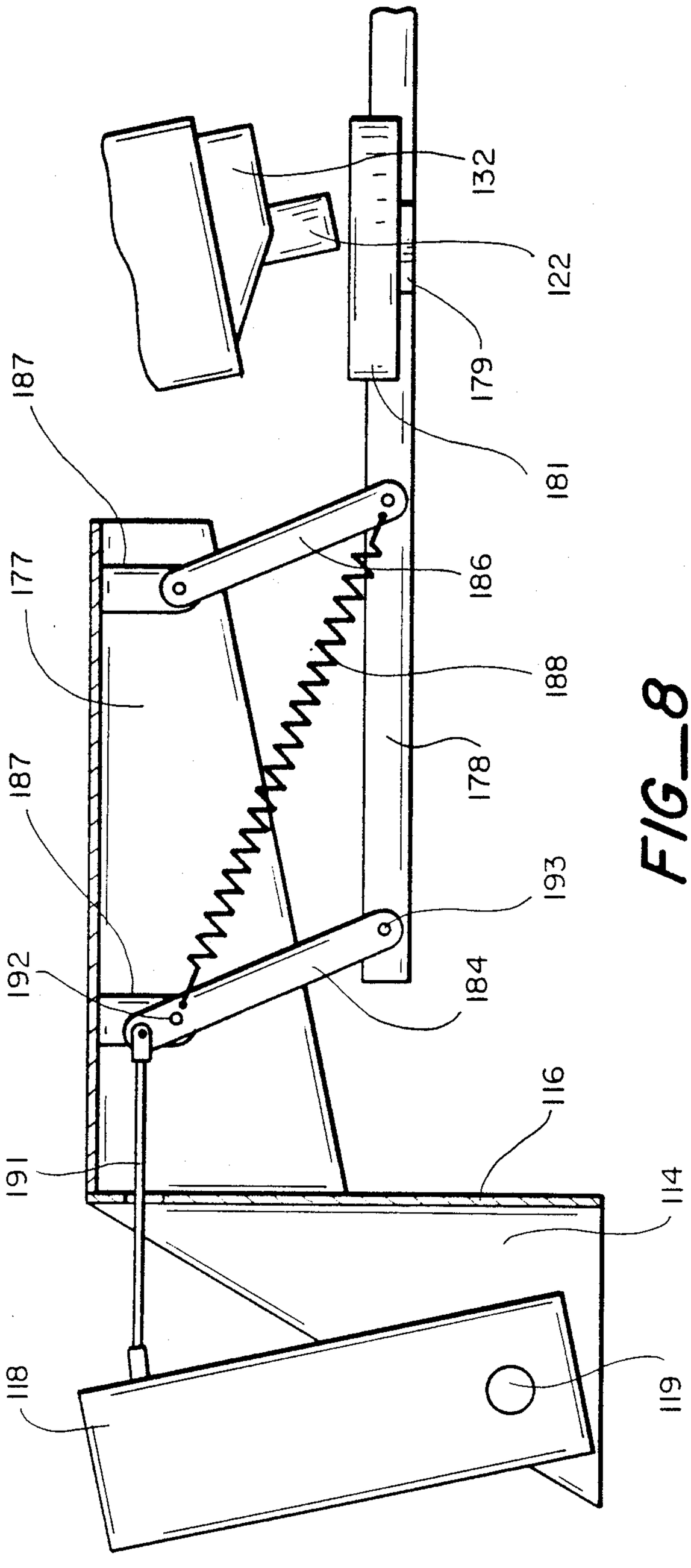
114
118
119

FIG_7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187
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186
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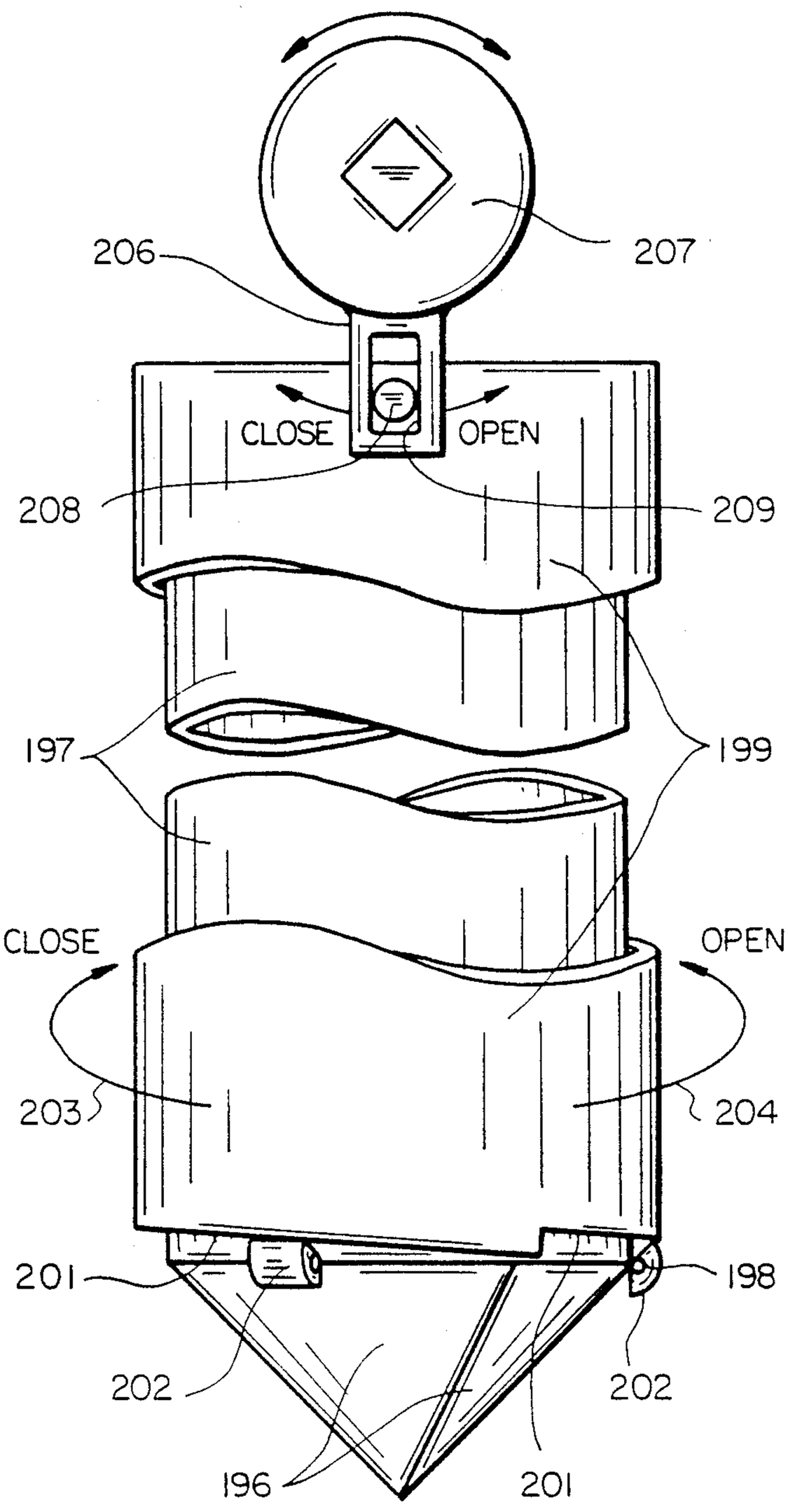
193
192
184
116
191
114
118
119

FIG_8


206
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196
201

FIG_9

CONTAINER FILLING APPARATUS

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention pertains to apparatus for filling drums and other containers with a liquid.

2. Description of the Related Art

Drums and other containers are commonly filled by machines having lances which may extend into the containers for delivering the liquid into the containers. Depending upon the nature of the liquid, the distal end or tip of the lance may be positioned either above or below the surface of the liquid during a filling operation. With liquids which tend to foam or produce fumes or noxious odors, the liquid is generally introduced at a relatively slow or "dribble" rate initially with the tip of the lance near the bottom of the container. Once the level of the liquid has risen above the tip of the lance, the flow rate can be increased, and the tip of the lance is maintained below the surface of the liquid for the remainder of the filling operation. This type of filling operation is known as subsurface filling. With other liquids, disturbance of the liquid during a filling operation is not a problem, and the lance can remain in the upper portion of the container. This type of filling operation is known as top filling. With either type of filling operation, the filling rate is generally decreased as the level of the liquid approaches the top of the container to prevent over filling and spillage of the liquid.

The amount of liquid which is delivered to a container and the rate at which it is introduced can be controlled either manually or automatically. A manually controlled system has the advantage of being somewhat simpler and less expensive to install, but it requires more time and attention on the part of the operator. An automated system is generally more expensive initially, but it is generally more economical to operate.

One example of an automated system for subsurface filling operations is described in U.S. Pat. No. 4,337,802.

It is in general an object of the invention to provide new and improved apparatus for filling drums and other containers with a liquid product.

Another object of the invention is to provide apparatus of the above character which overcomes at least some of the limitations and disadvantages of drum fillers heretofore provided.

Another object of the invention is to provide apparatus of the above character which is economical to manufacture and easy to operate.

SUMMARY OF THE INVENTION

These and other objects are achieved in accordance with the invention by providing drum filling apparatus having a base, an arm mounted on the base for movement between raised and lowered positions, and a filling lance carried by the arm for introducing a liquid into a container. Embodiments are enclosed for use in both subsurface filling operations and top filling operations. In both types of operations, the level of the liquid is monitored to prevent overfilling of the container, and in the subsurface system, the rate at which the lance is withdrawn is determined by the level of the liquid. A drip catcher is automatically positioned beneath the lance as it is withdrawn, and a self-closing cap is provided at the lower end of the lance. In one embodiment, the arm which carries the lance is pivotally mounted on the base, and in another embodiment the arm is mounted on and supported by an operating cylinder which serves as an extendable post. The flow control valves and the operating cylinders are pneumatically operated, and plastic lines are utilized in the pneumatic system.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a side elevational view, partly broken away, of one embodiment of container filling apparatus according to the invention.

FIG. **2** is an enlarged fragmentary side elevational view of the lower portion of the filling lance in the embodiment of FIG. **1**.

FIG. **3** is a bottom plan view of the lower portion of the filling lance in the embodiment of FIG. **1**.

FIG. **4** is block diagram of a system for controlling the assent of the lance and preventing overfilling of a container in the embodiment of FIG. **1**.

FIG. **5** is a side elevational view, partly broken away, of another embodiment of container filling apparatus according to the invention.

FIG. **6** is a block diagram of a system for preventing overfilling of the containers in the embodiment of FIG. **5**.

FIGS. **7** and **8** are operational views showing the operation of the drip catcher in the embodiment of FIG. **5**.

FIG. **9** is a side elevational view, partly broken away, of another embodiment of a lance cap or foot valve for use in container filling apparatus according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

As illustrated in FIG. **1**, the container filling apparatus has a base **11** on which a horizontally extending arm **12** is mounted, with a vertically extending lance **13** for introducing a liquid product into a container (not shown). As discussed more fully hereinafter, the arm is movable between raised and lowered positions so that the lance can be extended and retracted relative to the container.

Base **11** has a plate **16** which can be bolted to the floor or other supporting surface, with lower side plates **17** and a short upstanding post **18**. The post has a pair of telescopically extensible sections by which the length of the post and, hence, the height of arm **12** can be adjusted. A pneumatic operating cylinder **19** is mounted on the upper end of post **18** and extends in an upright position to form an extensible support column. In the embodiment illustrated, a flange at the lower end of the cylinder body is bolted to a flange at the top of the post, and arm **12** is affixed to the operating rod or piston of the cylinder. The operating cylinder is selected to have a stroke corresponding to the maximum distance the filling lance must travel between its extended and retracted positions. The cylinder is shown in its fully retracted position in FIG. **1**.

A front cover **21** is mounted on the base in a stationary position above lower side plates **17** and secured to mounting brackets (not shown) affixed to the body of cylinder **19**.

A manifold **22** which carries the liquid to be introduced into the container is mounted on horizontal arm **12**. The manifold comprises a horizontally extending tubular section **23** which is secured to arm **12** by U-bolts **24**. A pneumatically operated fill rate control valve **27** is

connected to the inlet end of the manifold, with connector **28** such as a quick disconnect fitting or a flange for connection to a hose or other conduit which carries the liquid product. Valve **27** can be set to provide either a normal or fast fill rate or a dribble or slow fill rate.

Lance **13** is connected to the outlet end of tubular section **23** by an elbow **31** and a pneumatically operated ball valve and actuator **32**. The manifold and the lance thus form a unitary structure and are raised and lowered together as cylinder **19** is extended and retracted. The ball valve serves as a flow control or ON/OFF valve for the liquid product.

A U-shaped top cover **33** covers the manifold and arm assembly and is secured to mounting plates **34** carried by the tubular section **23** of the manifold. A boot **36** provides a seal between the front mounting plate and the tubular section.

Air at a suitable pressure (e.g. 90 psi) for operating cylinder **19** and valves **27, 32** is applied to an inlet fitting **38**. The incoming air passes through a filter/regulator **39** and a lubricator **41**. The air is applied to valves **42** and **43, 44** which control the operation of cylinder **19** and valves **27, 32**, respectively. Valve **42** is mounted on the stationary body of the cylinder, and valves **43, 44** are mounted on arm **12**. Signals for controlling the operation of valves **42–44** are provided by air lines bundled into a cable **46** from a control panel (not shown).

Valve **42** is connected to the upper and lower ends of cylinder **19** by lines **47, 48**, respectively, with needle/-flow control valves **49** for adjusting the rate at which the cylinder is extended and retracted. Air is supplied to valves **43, 44** by a coiled line **51** which can extend and retract as the manifold and arm assembly is raised and lowered. The air from valve **43** is applied to the actuator for valve **27** by lines **52, 53**, and air from valve **44** is applied to the actuator for valve **32** by lines **54, 56**. The air lines and the fittings associated therewith are all fabricated of a suitable plastic material such as polyethylene, polypropylene or Teflon. The plastic lines are light in weight and relatively inexpensive, and they have been found to perform surprisingly well in the pneumatic system of the filling apparatus.

The air lines which carry the signals from cable **46** to valves **43, 44** are coiled within line **51** for extension and retraction as the arm and manifold assembly is raised and lowered.

A hinged cap **59** is provided at the lower end of lance **13**. This cap has a plurality of conically curved sections **61**, each of which is pivotally connected to the lower end of the lance by a hinge **62**. In the embodiment illustrated, the cap has three sections, but it can have any other suitable number desired (e.g., two, four, or more). Torsion springs **63** urge the sections of the cap toward the closed position in which the cap has a generally conical contour. The springs permit the cap to be opened by the liquid product which passes through the lance when valve **32** is open. In the closed position, cap sections **61** close off the lower end of the lance. In the open position, they swing back out of alignment with the passageway within the lance so that they do not impede the flow of liquid through the lance.

A vent line **64** and check valve vent the upper portion of the lance to the atmosphere to permit the liquid to drain from the lance when valve **32** is closed.

A drip catcher **66** is provided for catching any liquid which may drip from the lance when the lance is in its raised position. The drip catcher includes a stationary support arm **67** which extends horizontally from the upper portion of base **11**. A drip cup **68** is mounted on the support arm by parallel pivot arms **69, 71** for movement between extended and retracted positions relative to the lance. The drip cup is urged toward the extended position in alignment with the lance by a spring **71** connected between the lower end of pivot arm **69** and the upper end of pivot arm **71**. A roller or slide plate **73** carried by pivot arm **71** engages the side of the lance when the lance is in its extended or lowered position. When the lance is raised and the tip of the lance clears the roller, the drip cup swings to its extended position beneath the lance. As the lance descends, end cap **59** engages the roller, and the drip cup is deflected back to its retracted position.

A downwardly sloping drain trough **76** extends to the rear of drip cup **68**, and a drip collector **77** with a drain line **78** is mounted on the base beneath the rear end of the trough. Collector **77** is wide enough to remain beneath the end of the trough regardless of the position of the drip cup.

A wiper **79** is carried by the drip catcher assembly for wiping the liquid product from the exterior wall of the lance as the lance is raised. The wiper comprises an annular member mounted in a stationary position on arm **67** and encircling the lance. The liquid wiped from the lance drops into the container or the drip cup depending upon the position of the lance at the time.

A sensor **80** is mounted on arm **12** for interrupting the descent of the lance in the event that it should strike something on the way down, as might for example happen if the lance is not properly aligned with the fill hole in a drum. U-bolts **24** permit the manifold and lance to rise slightly relative to arm **12** if the lance meets resistance during its downstroke, and this movement is detected by sensor **80**.

Means is provided for monitoring the level of the liquid in the container and controlling the assent of the lance accordingly, as well as preventing over filling of the container. This means comprises a pair of sensing tubes **81, 82** which pass through the side wall of the lance near the top of the lance and extend downwardly within the lance. The opening at the lower end of tube **81** is positioned near the bottom of the lance below the level of the liquid during a normal filling operation. The lower end of tube **82** is spaced somewhat above the lower end of tube **81** and above the level of the liquid during a normal filling operation.

Air is bled into lines **81, 82** from a low pressure source (e.g. 5 psi) through needle valves **83, 84**. The pressure in the sensor tubes is monitored by snap relays **86, 87** which can detect a very small change in the pressure in the sensing lines (e.g. 0.1 inch water or 1/280 psi). The fluid output signals from the snap relays are applied to fluid amplifiers **88, 89**, and the amplified fluid signals are converted to electrical signals pressure responsive switches **91, 92**. The signals from these switches are applied to valve **42** to control the operation of cylinder **19** and, hence, the raising and lowering of the lance.

The components of the system for monitoring the level of the liquid in the container are enclosed in a housing **93** which is mounted on the lower portion of base **11**. The output signals from switches **91, 92** are carried by a cable **94**.

At the start of a filling operation, the lance descends to its full down position and remains there until the liquid in the container closes off the lower end of sensing line **81**. In normal operation, as the lance is with-

drawn, the lower end of sensing line **81** continues to be closed by the liquid, while line **82** remains open. Thus, the pressure in line **81** is normally greater than the pressure in line **82**. In the event that the lance is withdrawn too quickly, the lower end of line **81** will come out of the liquid, and the pressure in this line will drop. This drop in pressure is sensed by relay **86**, and switch **91** is actuated to cause operator control valve **42** to stop the assent.

If the liquid in the container rises too quickly or too high, the lower end of sensing line **82** will become submerged, and the pressure in this line will increase. This increase is sensed by snap relay **87** which actuates switch **92**. The signal from switch **92** is applied to control valve **42** to increase the rate of assent. This signal can also be utilized as a warning that an overflow is about to occur if the tip of the lance is near the top of the container.

The apparatus of FIG. **1** can be used either for subsurface filling or for top filling operations. As illustrated, the apparatus is best suited for subsurface operations. However, it can be converted to top filling operations simply by replacing lance **13** with a shorter lance. Adjustable stops **96** are provided for limiting the travel of the lance for top filling. The stops include a pair of vertically extending rods **97** which are threadedly received in nuts or ferrules affixed to the body of cylinder **19**. The rods extend in an upward direction through brackets **101** affixed to arm **12**, with stop members **102** at the upper ends of the rods limiting the upward travel of the arm and the lance. In the embodiment illustrated, rods **97** are bolts, and stop members **102** are the heads of the bolts. The amount of travel permitted can be adjusted by advancing or retracting the bolts. When unrestricted movement of the arm and lance is desired, as in a subsurface filling operation, bolts **97** can be removed or otherwise disengaged from brackets **101**.

The embodiment illustrated in FIG. **5** has a base **111** which includes a horizontally extending plate **112**, an upright post **113**, and side plates **114**. The post has two telescoping sections which permit the height of the post to be adjusted. A mounting bracket having a pair of side plates **115** and a front plate **116** is affixed to the upper end of the post.

A manifold and arm assembly **117** is pivotally mounted on post **113**. The assembly has depending stem **118** which is pivotally mounted between side plates **115** by means of a pivot pin **119**. A pneumatic operating cylinder **121** is connected between the base and the rear portion of the manifold and arm assembly for tilting the front portion of the assembly between raised and lowered positions.

The apparatus shown in FIG. **5** is designed for filling four drums or containers on a pallet and it provided with four lances **122** for this purpose. Two of the lances are visible in FIG. **5**, and the other two are behind these lances on the other side of the arm. The containers are typically filled one at a time, but they can be filled in a different manner, if desired.

The manifold assembly has a longitudinally extending tube **123** with a pneumatically operated ball valve and actuator **124**, **126** at its inlet end. This valve controls the fill rate, i.e. a slow fill or dribble rate or a fast fill or normal rate. Cross tubes **127** extend laterally from both sides of tube **123** toward its outlet end. Lances **122** are connected to the outer ends of the cross tubes, with a separate flow control valve **128** being provided for each of the lances. These valves are operated by pneumatic actuators **129**.

An exhaust manifold **131** is provided for removing any fumes which may be emitted during a filling operation. This manifold includes hoods **132** at the upper ends of the lances for collecting the fumes as they emerge from the containers.

Pressurized air (e.g. 90 psi) for operating cylinder **121** and valve actuators **126**, **129** is applied to an inlet fitting **134**. The air passes through a filter/regulator **136** and a lubricator **137** to electrically operated valves **138**, **139** which control the operation of cylinder **121** and the actuators for the valves **124**, **128**. Valve **138** is mounted on the body of cylinder **121**, and valves **139** are mounted on manifold and arm assembly **117**. As in the embodiment of FIG. **1**, pneumatic signals for controlling the operation of the valves are carried by air lines in a cable **141** from a control panel (not shown), and the valves are connected to the operating cylinder and the actuators by lines fabricated of a suitable material such as plastic.

A cover **142** is mounted on the upper portion of the base, and a top cover **143** is mounted on the manifold and arm assembly.

Means is provided for monitoring the level of the liquid in the containers to prevent over filling of the containers. As illustrated in FIG. **6**, this means includes sensing lines **146–149** with discharge openings positioned near the lower ends of the respective lances. If desired, the sensing lines can extend below the ends of the lances in this embodiment. Lower pressure air (e.g. 5 psi) is bled into the sensing lines through needle valves **151–154**. The pressure in the respective lines is monitored by snap relays **156–159**, and the fluid output signals from the relays are amplified by fluid amplifiers **161–164**.

The outputs of the fluid amplifiers are connected to shuttle valves **166–168** which are connected together in a logic network to provide an output signal in the event of a change in pressure in any of the sensing lines. The outputs of fluid amplifiers **161**, **162** are connected to the inputs of shuttle valve **166**, and the output of this valve and the output of fluid amplifier **164** are connected to the inputs of shuttle valve **167**. The output of this valve and the output of fluid amplifier **163** are connected to the inputs of shuttle valve **168**.

The fluid output signal from shuttle valve **168** is applied to a pressure responsive switch **169** through a reset valve **171**. Switch **169** controls the operation of a warning lamp **172** or another suitable indicator.

The system for monitoring the level of the liquid in the containers is enclosed in a housing **173** which is mounted on the lower portion of base **111**.

In operation, sensing lines **146–149** are positioned to be closed by the liquid in the containers if it should rise too high. During normal operation, the ends of the lines are out of the liquid, and the low pressure air passes through the lines freely. If the level of the liquid should rise too high in one of the containers, it will close the line in that container, and the pressure in the line will increase. This increase is detected by the corresponding snap relay, producing an output signal at the corresponding fluid amplifier which is applied to the shuttle valves. This signal passes through the shuttle valves to the pressure responsive switch, causing an overfill indication to be given. If desired, the signal from switch **169** can be utilized to close valves **128** to interrupt the delivery of liquid to the containers.

A drip catcher **176** is provided for catching drippage from lances **122** when the lances are in their raised or retracted position. The drip catcher includes a stationary support arm which extends horizontally from mounting bracket **114**, **116** at the upper end of post **113**.

The drip catcher includes a central trough **178** which extends in a longitudinal direction below manifold tube **123**, with side troughs **179** extending laterally from the central trough. Drip cups **181** are mounted on the outer ends of the side troughs. The side troughs slope downwardly toward the center troughs, and the center trough slopes downwardly toward the rear. A drip collector **182** with a drain line **183** is mounted on the base in position for collecting the liquid from trough **178**.

The drip cup and trough assembly is carried by parallel pivot arms **184**, **186** for swinging movement between advanced and retracted positions. It is shown in the retracted position in FIG. **5**. The upper ends of pivot arms **184**, **186** are pivotally connected to mounting brackets **187** which are affixed to support arm **177**. The drip cups are urged toward the retracted position by a coil spring **188** which is connected between the upper end of arm **184** and the lower end of arm **186**.

A flexible cable **191** is connected between the upper portion of pivot arm **184** and the stem **118** of manifold and arm assembly **117** for moving the drip cups to their advanced position. The cable is somewhat longer than the distance between the pivot arm and the manifold stem when the manifold is in its lowered position so that the cable will not become taut until the bottoms of the lances have risen almost above the drip cups. The cable is connected to pivot arm **184** at a point just above the pin **192** which mounts the arm on bracket **187**. Since the distance between the cable connection and pin **192** is much less than the distance between this pin and the pin **193** which connects the arm to the trough, a small movement of the cable produces a much greater movement of the cup and trough assembly.

In operation, spring **188** holds the cup and trough assembly in the retracted position until the lances have almost reached the top of their stroke. Prior to this point, cable **191** is relaxed, as illustrated in FIG. 7. As the lances approach the top of their stroke, the cable tightens, as illustrated in phantom lines in FIG. 7. As the manifold and lance assembly continues its upward movement, the taut cable causes pivot arms **184**, **186** to pivot in a counter clockwise direction, swinging the drip cup and trough assembly to the advanced position in which drip cups **181** are positioned beneath the lances. Because of the slackened cable and the mechanical advantage provided by pivot arm **184**, the drip cup and trough assembly does not begin to move until the lances have almost completed their assent, at which point it moves very rapidly to the advanced position. When the lances are lowered, spring **188** returns the cup and trough assembly to its retracted position.

The end cap or foot valve illustrated in FIG. **9** is similar to the end cap or foot valve in the embodiment of FIG. **1** in that it has a plurality of conically curved sections **196** which are pivotally mounted on the lower end of lance **197** by hinges **198** for movement between open and closed positions. A control sleeve **199** is rotatably mounted on the lance and has a plurality of inclined cam surfaces **201** around its lower end. These surfaces engage arms or flanges **202** which extend upwardly and outwardly from the curved sections. When the sleeve is rotated in the direction indicated by arrow **203**, the cam surfaces bear against the arm or levers and press the curved sections together to close the valve. When the sleeve is turned in the direction indicated by arrow **204**, the cam surfaces are moved out of contact with the arms or flanges, and the curved sections are free to swing to the open position in response to gravity and the liquid product discharged through the lance.

The end cap or foot valve is moved between its open and closed positions by means of a crank arm **206** which is affixed to the rotary actuator **207** for the ball valve (not shown) which controls the flow of product through the lance. A pin projects radially from the upper portion of sleeve **199** and is received in a slotted opening **209** in the crank arm. As the actuator rotates about a horizontal axis, the crank arm and pin turn the sleeve about a vertical axis to open or close the foot valve.

In the embodiments disclosed, pneumatic cylinders are employed for raising and lower the filling lances. It will be understood, however, that other types of fluid operated actuators (e.g., hydraulic cylinders or combined air and hydraulic cylinders) can be used for this purpose. A hydraulic fluid generally provides a smoother, less abrupt movement than air. Suitable plastic materials for the lines in a hydraulic system include polyvinyl-difluoride and polypropylene.

It is apparent from the foregoing that a new and improved apparatus for filling drums and other containers has been provided. While only certain presently preferred embodiments have been described in detail, as will be apparent to those familiar with the art, certain changes and modifications can be made without departing from the scope of the invention as defined by the following claims.

I claim:

1. In apparatus for filling a container with a liquid: a base, an arm mounted on the base for movement between raised and lowered positions, a filling lance carried by the arm for introducing the liquid into the container, a first sensing tube carried by the lance and having a discharge opening which is normally positioned above the level of the liquid in the container, a second sensing tube having a discharge opening positioned below the discharge opening in the first named sensing tube and normally below the level of the liquid in the container, means for introducing a fluid into the sensing tubes, means for withdrawing the lance from the container as the container is filled, means for monitoring the pressure of the fluid in the sensing tubes, and means responsive to the pressure of the fluid in the tubes for increasing the rate at which the lance is removed in the event of an increase in the pressure in the first tube and decreasing the rate at which the lance is removed in the event of a decrease in the pressure in the second tube.

2. The apparatus of claim **1** including a drip catcher movable between advanced and retracted positions relative to the lance, and means for moving the drip catcher to its advanced position when the lance is withdrawn from the container.

3. The apparatus of claim **2** wherein the means for moving the drip catcher to the advanced position comprises a flexible cable which is relaxed when the arm is in its lowered position and is drawn taut by movement of the arm toward its raised position, and means connecting the cable to the drip catcher in such manner that the drip catcher is moved to its advanced position upon further movement of the arm toward its raised position.

4. The apparatus of claim 3 wherein the drip catcher is mounted on the base by a pivot arm for swinging movement between the advanced and retracted positions, one end of the cable is connected to the arm which carries the lance, and the other end of the cable is connected to the pivot arm at a point spaced from the drip catcher so that the drip catcher moves a greater distance then the end of the cable connected to the pivot arm.

5. The apparatus of claim 1 wherein the arm is pivotally mounted on the base.

6. The apparatus of claim 1 Wherein the base includes an operating cylinder mounted in an upright position for movement between vertically extended and retracted positions, with the arm and the lance carried thereby being mounted on and supported by the cylinder.

7. The apparatus of claim 1 including a fluid operated cylinder for moving the arm between its raised and lowered positions and a pneumatically operated valve for controlling introduction of the liquid through the lance, and flexible plastic lines for supplying pressurized fluid to the fluid operated cylinder and to the pneumatically operated valve.

8. The apparatus of claim 1 including a cap at the lower end of the lance movable between open and closed positions, and means yieldably urging the cap toward its closed position but permitting the cap to be moved to its open position by the liquid passing through the lance.

9. The apparatus of claim 1 wherein the fluid introduced into the sensing tubes is air.

10. The apparatus of claim 9 wherein the air is introduced into the sensing tubes at a pressure on the order of 5 psi.

11. In apparatus for filling a container with a liquid: a base, an arm mounted on the base for movement between raised and lowered positions, a filling lance carried by the arm for introducing the liquid into the container, a cap having a plurality of conically curved sections hingedly connected to the lower end of the lance for movement between open and closed positions, said sections in the closed position forming a conically shaped closure of no greater diameter than the lance, means yieldably urging the cap sections toward the closed position but permitting the sections to be moved to the open position by the liquid introduced through the lance, a sensing tube carried by the lance and having a discharge opening which is normally positioned above the level of the liquid in the container, means for introducing a fluid into the sensing tube in such manner that it normally flows through the tube and out the discharge opening, and means for monitoring the pressure of the fluid in the sensing tube to determine an overfill condition in the event that the liquid in the container rises to a level which blocks the discharge opening of the tube.

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